SOUTHWEST FISHERIES SCIENCE CENTER
FOURTH QUARTER REPORT - FY 2001
For the period July 1, 2001 through September 30, 2001

Submitted by: John Hunter, Division Director, Fisheries Resources Division

Title of accomplishment or milestone: Sardine Migratory Model

Current status: Satisfactory Progress

Background information: As the sardine population approached a quarter million tons, we discovered by chance (Russian-American Trachurus survey 1991) that there is substantial occurrence of sardine offshore of the CalCOFI survey. In the ensuing years, cruises along the Central California coast established that most of the sardine spawning was outside the CalCOFI surveys. Monitoring of the southern stock spawning area was begun by IMECOCAL following the binational 1994 Sardine Spawning Biomass survey. Sardines were described as occurring commonly in the Gulf of Alaska and were a dominant off British Columbia and spawning surveys showed summer spawning off Washington and Oregon.

Purpose of activity: We compile an improved model of the age-, length-, and stock- specific migrations of the sardine for a new management model and to support the development of an ecosystem multi species model including sardine.

Description of accomplishment and significant results: Virgin stocks of sardines were separated by the temperature of early development into a southern stock (20+ C) and a northern stock (14 C). Spawning was delayed in the northern stock resulting in larger maturing fish approaching 200 mm with a tendency to migrate substantially, latitudinally. The natural mortality of the southern stock is about 0.8 and the northen stock is 0.2 on an instantaneous annual basis. We will prepare two migration models for comparison: one was developed for hake migration using length-at-age data and a migratory velocity model; the other model was developed for halibut based on tags. Our approach will be to build a likelihood function which includes both the length-at-age data and observed returned tags by latitude.

Significance of accomplishment: A coast wide approach to the management of the sardine should avoid repeat loss of the northern stock.

Problems: There are not mechanisms for evaluating the biomass and catch of the two stocks. The wide latitudinal spread of the species between 20 and 60 degrees north through the jurisdictions of four states of the US and two states of Mexico, and British Columbia Canada compounds our lack of knowledge. There is no effort to evaluate the offshore limits of sardines which now appear to equal the *Trachurus* offshore: this means that the fishery conducted within 20 miles of the coastline in California will have a biased sample of the sardine age composition.

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